LESSON TITLE: SAFETY RULES AND PROCEDURES FOR DRIVING UNDER ADVERSE WEATHER CONDITIONS

A. TRAINING OBJECTIVE

TASK: Demonstrate knowledge of procedures for driving under adverse weather conditions (rain, ice, snow, fog, smog, and thunderstorms).

CONDITIONS: Given instruction in a classroom.

STANDARD: Correctly answer verbal questions when called upon.

B. INTERMEDIATE TRAINING. None.

C. ADMINISTRATIVE INSTRUCTIONS

1. Training time: Recommended instructional time is 0.5 hours.

2. Training location: Scheduled classroom.

3. Training type: Conference.

4. Students: Scheduled personnel.

5. Principal and assistant instructors required: One primary instructor for each class of 20 students.

6. Training aids and equipment: Overhead projector, transparencies, screen, and student handout at pages 4-112 through 4-118 (sufficient copies should be reproduced prior to scheduled class time).

7. References: FM 21-305.

D. SEQUENCE OF ACTIVITY

1. **INTRODUCTION**.

a. **Interest Device**. A road that is safe under most conditions is dangerous if it gets slippery. Ice and packed snow can easily induce a skid especially if you are traveling too fast, driving over bridges and hills, around curves, or braking to a stop. If you are forced to drive through standing water or to drive in the rain where the water is deep enough to allow rain bubbles to stand on the surface, you may lose contact with the road surface and hydroplane.

b. **Tie-in**. Bad weather can affect driving by reducing visibility and traction. Either condition can lead to loss of control. If you must drive under adverse weather conditions, it is helpful to have the facts and skills needed to cope with them.

c. **Lesson Objective**.

ACTION: After this lesson the student will know the procedures for driving under adverse weather conditions (rain, ice, snow, fog, smog, and thunderstorms).

CONDITIONS: Given instruction in a classroom.

STANDARD: Correctly answer verbal questions when called upon.

d. **Procedures**.

(1) ***Explanation***.

(2) ***Summary***.

2. **EXPLANATION**.

Transparency 4-104

a. **Rains**.

(1) Drizzle or light rains normally fall from the low stratus clouds. The droplets are usually small with only a slight accumulation of moisture on surfaces. This type of rain may create very slick driving surfaces. The first few minutes of a light rain or drizzle causes the oils, chemicals, dirt, and rain to mix, creating a very slick surface. It is recommended extreme caution be used when operating on this type surface. Expect visibility restriction, slippery surfaces, reduced traction, increased stopping distance, and a high probability of skids. ***Corrective action: moderate acceleration, reduce speed, moderate brake application, and make no quick or fast turns.***

(2) Heavy rains or downpours (sometimes called cloudbursts) are very intense rainstorms that are associated with the cumulonimbus cloud formation. The cumulonimbus cloud is a white cloud that builds to a great height. The top forms in the shape of an anvil and is called a thunderstorm by most. These storms usually only last about 30 minutes or less. They produce high winds and blowing objects associated with heavy rains and lightning. The heavy rains create standing water on the roadways, thus increasing the possibility of hydroplaning. Expect poor visibility, reduced

traction, increased stopping distance, and possible loss of directional control. ***Corrective action: reduce speeds, moderate acceleration, moderate braking applications, and make no quick or fast turns.***

(3) Freezing rains form when moisture falls as rain, and when it comes in contact with a solid object, it freezes. When the ground level temperature is below freezing, it causes the supercooled droplets to freeze on contact. The ice will adhere to the roadway, equipment, and most flat surfaces creating a very hazardous condition for all types of operations. All movement should stop unless life threatening. Expect slippery surfaces, poor visibility, little to no traction, little to no braking action, reduced directional control, and high possibility of skids. ***Corrective action: stop movement until the condition changes. If movement is a must, it must be at a very slow pace.***

Transparency 4-105

b. **Ice**.

(1) Ice is a water substance in solid form. Formation is possible anytime moisture is present and the temperature is 32 degrees F or below. Expect bridges and overpasses to become slick or iced over first. Ice creates very hazardous conditions. Expect reduced traction, increased braking distance, poor directional control, and possibility of skids. ***Corrective action: moderate acceleration, reduce speeds, increase following distances, light braking, and make no quick or fast turns.***

(2) Frost is a covering of minute ice crystals on a cold surface. Frost forms when the surface temperature is at or below dewpoint temperature and the dewpoint temperature is below freezing. Bridges and overpasses tend to give up the heat much quicker than the surrounding areas, thus forming frost before the adjoining roadways and creating a hazardous surface and driving condition. A vehicle operating in a subfreezing air mass going into a warmer air mass may encounter frost. Expect slippery surfaces, reduced traction, reduced directional control, and increased braking distance. Frost often occurs on windshields and may cause a restriction to or total loss of visibility. ***Corrective actions: reduce speed, moderate braking, moderate turns, and increase following distances.***

(3) Snow is precipitation in the form of small ice crystals formed directly from the water vapor of the air at a temperature of less than 32 degrees F. Snow does not create a major hazard unless there is an accumulation. Expect reduced visibility, reduced traction, less directional control, and increased braking distance. When snow melts and refreezes, a very dangerous driving surface is created. Drivers should be aware of the

dangers of this condition and look for it in areas near intersections, any high traffic areas, and areas that are in direct sunlight and are shaded in the afternoon where the moisture may refreeze. ***Corrective action: reduce speed, moderate braking, moderate turns, and increase following distances.***

Transparency 4-106

(4) Hail is precipitation in the form of small balls or lumps consisting of concentric layers of clear ice or compact snow that fall from cumulonimbus clouds. Expect possible surface damage to the vehicle and a possibility of broken windows from the hail. It normally does not remain on the ground for an extended length of time; therefore, it will only be a short interruption to operations. ***Corrective action: stop operations until storm passes.***

(5) Sleet is frozen or partly frozen rain. Sleet can create a very hazardous surface making driving very dangerous. Expect slippery surfaces, poor traction, increased braking distances, and reduced directional control. ***Corrective action: reduce speed or stop, use very light braking, increase following distances, and make no quick or sudden turns.***

(6) Windshield icing may occur anytime the temperature is low enough and there is sufficient moisture present. Anytime you are operating in cold temperatures and there is visible ground haze, the conditions are present for frost or icing. Expect reduced to no forward visibility through the windshield until the ice is removed. ***Corrective action: use the windshield defroster and scrape windshield as necessary.***

(7) Black ice is a thin sheet of ice, relatively dark in appearance and may be formed when light rain or drizzle falls on a road surface which is at a temperature below 32 degrees F. It may also form when supercooled fog droplets are intercepted by bridges, overpasses, trees, and so on. Expect where shadows exist, the layer of ice is clear enough that you can see the road underneath it. A good indicator of black ice is the road looks wet and temperature is below freezing. Proceed with caution because a surface with black ice is a very dangerous driving surface. Expect little to no traction, little to no braking capability, extremely poor directional control, and high possibility of skids. ***Corrective action: stop operations. If operations must continue, reduce speed, accelerate very slowly, increase following distances, use very light braking action, and make all turns very gradual and slow.***

Transparency 4-107

(8) Glaze (clear ice) is a deposit of ice formed by the freezing of supercooled drizzle droplets or raindrops on surfaces that are 32 degrees F or below. It may also be produced by the freezing of warm light rain or drizzle (non-supercooled) immediately after the impact with surfaces that are well below 32 degrees F. This is a very dangerous driving surface. Expect little to no traction, little to no braking capability, extremely poor directional control, and high possibility of skids. ***Corrective action: stop operations. If operations must continue, reduce speed, accelerate very slowly, increase following distances, use very light braking action, and make all turns very gradual and slow.***

(9) Frost heaving is the uneven lifting and distortion of the ground close to the surface. It results from the expansion of water within the soil when the soil reaches temperatures low enough to freeze the ground. This may cause damage to the road surfaces and loosen the roots holding plants and trees. Expect uneven driving surfaces. Interrupted directional control could present a problem on curves at highway speeds. ***Corrective action: reduce speed.***

Transparency 4-108

c. **Fog**.

(1) Fog is a vapor condensed to fine particles of water suspended in the lower atmosphere that differs from a cloud only in being near the ground. Fog makes driving difficult because of the reduced visibility. Visibility may get so bad that driving may be too hazardous to continue. ***Corrective action: reduce speed, increase following distances, turn on lights.***

(2) Advection fog forms by the passage of relatively warm, moist, and stable air over a cool surface. It is associated mainly with cool sea areas, particularly in the spring and summer, and may affect adjacent coast. It may also occur over land in winter, particularly when the surface is frozen or snow-covered. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(3) Upslope fog forms when moist, stable air flows up a sloping land surface. When the air rises, it cools by expansion as the atmospheric pressure decreases. When the expansional cooling is sufficient to lower the temperature of the air to the dewpoint temperature, upslope fog may form. The windspeed must be adequate to support continued upslope motion. If the wind is too strong, the fog may be lifted from the surface, creating an

overcast of low stratus clouds. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(4) Valley fog forms during the evening hours when cold dense air drains from areas of higher elevation into low areas or valleys. As the cool air accumulates in the valley, the air temperature may decrease to the dewpoint temperature creating a dense formation of fog. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(5) Frontal fog forms when liquid precipitation, falling from the warm tropical air above the frontal surface, evaporates in the colder air below the frontal surface. Evaporation from the falling drops may add sufficient water vapor to the cold air to raise the dewpoint temperature to the temperature of the air. The cold air will then be saturated and frontal fog will form. Frontal fog is common with active warm fronts during all seasons. Frontal fog occurs ahead of the surface front in an area approximately 100 miles wide. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(6) Steam fog forms when cold stable air flows over a nonfrozen water surface that is several degrees warmer than the air. The intense evaporation of moisture into the cold air saturates the air and produces fog. Conditions favorable for steam fog are common over lakes and rivers in the fall and over the ocean in the winter when an offshore wind is blowing. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(7) Ice fog is suspended ice crystals usually formed with the introduction of water into clear, calm air of low temperature (-37 degrees F or lower). Ice fog is rare at temperatures above -37 degrees F and almost always present at temperatures below -50 degrees F. Ice fog may form over a body of troops, herd of animals, bivouac areas, motor parks, convoys, and gun positions during firing. Reduced visibility is the major hazard to driving. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(8) Freezing fog is composed of liquid water droplets, but the droplets are in a supercooled state, only forming when the temperature falls below 32 degrees F and freezing as soon as they come in contact with a cold surface. If the surface or roadway is at or below freezing, the fog will form ice, creating a very hazardous condition. Expect reduced visibility, poor traction, increased braking distances, poor directional control, and possible skids. ***Corrective action: turn on lights, reduce speed, accelerate slowly,***

increase following distances, use moderate braking applications, and make no quick or fast turns.

Transparency 4-109

d. **Smog**.

(1) Smog is a combination of smoke and fog. Water droplets form around solid particles in the atmosphere; therefore, it forms more easily than fog and is slower to clear. Smog may persist for days. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

(2) Photochemical smog is created completely independent of atmospheric humidity level, being initiated by the action of sunlight on fumes from car exhaust and consists of a mixture of nitrogen dioxide, ozone, and a chemical known as PAN (peroxyacyl nitrate). A combination of these gases causes eye irritation, coughing, and fatigue. Expect reduced visibility. ***Corrective action: turn on lights, reduce speed, and increase following distances.***

e. **Dew**. Dew forms on objects during clear, still nights when the objects are cooled by radiation to a temperature at or below the dewpoint of the adjacent air. The moisture collects on these objects just like it does on a pitcher of ice water in a warm room. Heavy dew is often observed on grass and plants when there is none on the pavement or on large solid objects. These solid objects absorb so much heat during the day, or give up heat so slowly, that they may not cool below the dewpoint of surrounding air during the night. Bridges and overpasses give up the heat much quicker than the surrounding areas, thus forming dew or frost before the adjoining roadways, creating a slippery surface. Expect reduced traction, increased braking distance, and possible skids. ***Corrective action: reduce speed, accelerate slowly, increase following distances, use moderate braking applications, and make no quick or fast turns.***

Transparency 4-110

f. **Thunderstorms**.

(1) The cumulonimbus cloud is the key in identifying a thunderstorm. These large billowing clouds carry high moisture content and are associated with high winds of short duration. An average of 44,000 thunderstorms occur daily over the surface of the earth. They almost always consist of strong gusts of wind, severe turbulence, heavy rains, and lightning. During a thunderstorm, hail is uncommon and tornadoes are possible. Most thunderstorms pass within 30 minutes. Expect reduced

visibility, slippery surfaces, reduced traction, increased braking distances, and possible skids. ***Corrective action: use lights, reduce speed, accelerate slowly, increase following distances, use moderate braking applications, and make no quick or fast turns.***

(2) First gust is a hazard associated with thunderstorms. It is the rapid change in direction and windspeed immediately prior to a storm's passage at the surface. The speed of this first gust may exceed 75 knots and vary 180 degrees from the prevailing surface winds. The first gust usually precedes the heavy precipitation and strong gusts may continue for 5 to 10 minutes with each thunderstorm cell. First gusts are not limited to the area ahead of the storm's movement. They may be found in all sectors, including the area back of the storm's movement. Expect high winds, blowing items, and possible sudden crosswinds with high gusts. ***Corrective action: stop until the storm passes. If you must continue, reduce speed and counter steer to compensate for the unexpected gusts.***

3. **SUMMARY**.

Transparency 4-111

a. **Recap Main Points**. Call on students to answer questions presented on Transparency 4-111.

b. **Allow for Questions**.

c. **Clarify Questions**.

NOTE: PASS OUT STUDENT HAND OUT - WEATHER EVALUATION GUIDE, pages 4-112 through 4-118 (ONE COPY TO EACH STUDENT).

d. **Give Closing Statement**. Remember that changes in weather conditions will affect the way your vehicle handles and you must be ready to respond. The first rule is to slow down to make up for reduced visibility and reaction time in any kind of bad weather.

E. SAFETY RESTRICTIONS. None.

F. ADDITIONAL COMMENTS AND INFORMATION. None.